

**Notice of Allowability**

Application No.

09/706,625

Examiner

Li B. Zhen

Applicant(s)

BACON ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to response filed 04/12/2007 and interview on 6/18/2007.
2. ☒ The allowed claim(s) is/are 1,7-10 and 12-16, renumbered as claims 1-10.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |   |
|--|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application   |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date <u>6/18/2007</u> . |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____    | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment   |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance                          |
|  | 9. <input type="checkbox"/> Other _____.  |

### **DETAILED ACTION**

1. Claims 1, 7 – 10 and 12 – 16 are pending in the application.

#### ***Continued Examination Under 37 CFR 1.114***

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 03/08/2007 has been entered.

### **EXAMINER'S AMENDMENT**

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Thomas Beck (Reg. No. 20,816) on 18 June 2007.

The application has been amended as follows:

- a. Page 4, lines 17 – 19 of the specification, delete the hyperlink "(see: <http://www.cs.utah.edu/flux/papers/kaffeos-osdi00/main.html>)";

- b. Page 4, lines 22 – 24 of the specification, delete the hyperlink “(see: [http://www.oracle.com/database/documents/jserver\\_scalability\\_and\\_performance\\_twp.pdf](http://www.oracle.com/database/documents/jserver_scalability_and_performance_twp.pdf))”;
- c. Page 5, line 5, replace “US patent application 09/304160” with “U.S. Patent No. 6,694,346”;
- d. Page 6, line 7, replace “US patent application 09/584641” with “U.S. Patent No. 7,134,123”;
- e. Page 24, lines 14 – 15, replace “US patent application 09/584641” with “U.S. Patent No. 7,134,123”; and
- f. Replace claims 1, 12, 15 and 16 with the following:

1. A computer system comprising an object-based virtual machine environment using multiple heaps enabling a single virtual machine to be resettable thereby avoiding a need to terminate and start a new virtual machine, in which middleware runs successive applications on a single virtual machine, said system including storage for storing objects for running said applications, said storage being logically divided into three heaps:

a system heap wherein system classes for said single virtual machine are loaded, linked, verified, initialized and compiled into said system heap, thereby providing subsequent applications with the ability to use these classes without having to reload them and which said system heap is not garbage collected, wherein subsequent applications reuse said classes in said system heap thus eliminating the need for repeating the reloading, linking, verifying and compiling of said classes;

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a middleware heap which is garbage collected between successive applications; and wherein reusable objects other than class objects that must persist between successive applications, are stored in said middleware heap;

a transient heap which is entirely cleared in between successive applications, and which has no garbage collected within the lifetime of an application, said transient heap, being used for storing applications of objects that are used for only the duration of an application, any objects that are pointed to by objects in said system are moved into said middleware heap and including a middleware classloader and an application classloader, wherein objects from classes loaded by the middleware classloader will be created in said middleware heap, and objects from classes loaded by the application classloader will be created in said transient heap;

the use of said three heaps enabling a single virtual machine to retain data and objects across multiple applications;

the use of said transient heap providing a more efficient method of garbage collection that enables said virtual machine to quickly reset the transient heap thereby creating a greater virtual machine.

12. The computer system of claim 1, further including one or more system classloaders, wherein objects from classes loaded by the one or more system classloaders are created in the middleware heap or the transient heap depending on the current context.

15. A method of operating a computer system providing an object-based virtual machine environment, using multiple heaps enabling a single virtual machine to be resettable thereby avoiding a need to terminate and start a new virtual machine, in which middleware runs successive applications on a single virtual machine, said system including storage for storing objects for running said applications, said method comprising the steps of:

logically dividing the storage into three heaps:

a system heap wherein system classes for said single virtual machine are loaded, linked, verified, initialized and compiled into the system heap, thereby providing subsequent applications with the ability to use these classes without having to reload them;

a middleware heap; and

a transient heap;

moving any objects that are pointed to by other objects into said middleware heap and including a middleware classloader and an application classloader, wherein objects from classes loaded by the middleware classloader will be created in said middleware heap, and objects from classes loaded by the application classloader will be created in said transient heap;

performing garbage collection on the said middleware heap between successive applications; and wherein reusable objects other than class objects that must persist between successive applications, are stored in said middleware heap and performing garbage collection on said the transient heap, but not on the said system heap; and

clearing the transient heap in between successive applications, said transient heap being used for storing applications objects that are used for only the duration of an application and which has no garbage collected within the lifetime of an application.

16. A computer program product comprising computer program instructions stored on a storage device for loading into a computer system which provides an object-based virtual machine environment, using multiple heaps enabling a single virtual machine to be resettable thereby avoiding a need to terminate and start a new virtual machine, in which middleware runs successive applications on a single virtual machine, said system including storage for storing objects for running said applications, said instructions causing the computer system to perform a method comprising the steps of:

logically dividing the storage into three heaps:

a system heap wherein system classes for said single virtual machine are loaded, linked, verified, initialized and compiled into said system heap, thereby providing subsequent applications with the ability to use these classes without having to reload them;

a middleware heap; and

a transient heap;

moving any objects that are pointed to by other objects into said middleware heap and including a middleware classloader and an application classloader, wherein objects from classes loaded by the middleware classloader will be created in said

middleware heap, and objects from classes loaded by the application classloader will be created in said transient heap;

performing garbage collection on the said middleware heap between successive applications; and wherein reusable objects other than class objects that must persist between successive applications, are stored in said middleware heap and performing garbage collection on said the transient heap, but not on the said system heap; and

clearing the transient heap in between successive applications, said transient heap being used for storing applications objects that are used for only the duration of an application and which has no garbage collected within the lifetime of an application.

#### **REASONS FOR ALLOWANCE**

4. The following is an examiner's statement of reasons for allowance:

The prior art of record does not expressly teach or render obvious the invention as recited in independent claims 1, 15 and 16.

The prior art teaches a virtual machine [column 3, lines 60 – 67 of Ungar], a system heap [column 5, lines 25 – 30 of Ungar] that is not garbage collected [column 5, lines 1 – 45 of Ungar], a transient heap [column 5, lines 1 – 45 of Ungar] which is cleared in between successive applications, and which has no garbage collected within the lifetime of an application [col. 5, lines 13 – 25 of Ungar], and a middleware heap [p. 6 – 7, Section 4.4 of O'Toole]. However, the prior art does not teach storing reusable objects other than class objects that must persist between successive applications in said middleware heap, moving any objects that are pointed to by other objects into said

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middleware heap, and including a middleware classloader and an application classloader, wherein objects from classes loaded by the middleware classloader will be created in said middleware heap, and objects from classes loaded by the application classloader will be created in said transient heap.

In addition, the prior art of record does not provide a basis of evidence for asserting a motivation that one of ordinary skill level in the art at the time the invention was made would have integrated or modified the virtual machine of the prior art to incorporate the features of storing reusable objects other than class objects that must persist between successive applications in said middleware heap, moving any objects that are pointed to by other objects into said middleware heap, and including a middleware classloader and an application classloader, wherein objects from classes loaded by the middleware classloader will be created in said middleware heap, and objects from classes loaded by the application classloader will be created in said transient heap as recited in the context of independent claims 1, 15 and 16.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

#### **CONTACT INFORMATION**




5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Li B. Zhen whose telephone number is (571) 272-3768. The examiner can normally be reached on Mon - Fri, 8:30am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Thomson can be reached on 571-272-3718. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li B. Zhen  
Examiner  
Art Unit 2194

LBZ



6/18/2007